



U.S. Department of the Interior
Bureau of Land Management

Willow Master Development Plan

Administrative Draft SEIS: Key Issues Workshop #3

Fish Creek in the Willow Master Development Plan Area
Photo by ABB, Inc.

Air Quality and GHG Analysis

Cooperating Agency Meeting
March 29, 2022

The information contained in this presentation is preliminary and not for
public distribution



Zoom Ground Rules & Requests



Please keep your microphone muted.



Use "Chat" to view the chat window or send a message.



Select "Raise Hand" under "Reactions" to indicate you have a question/comment.

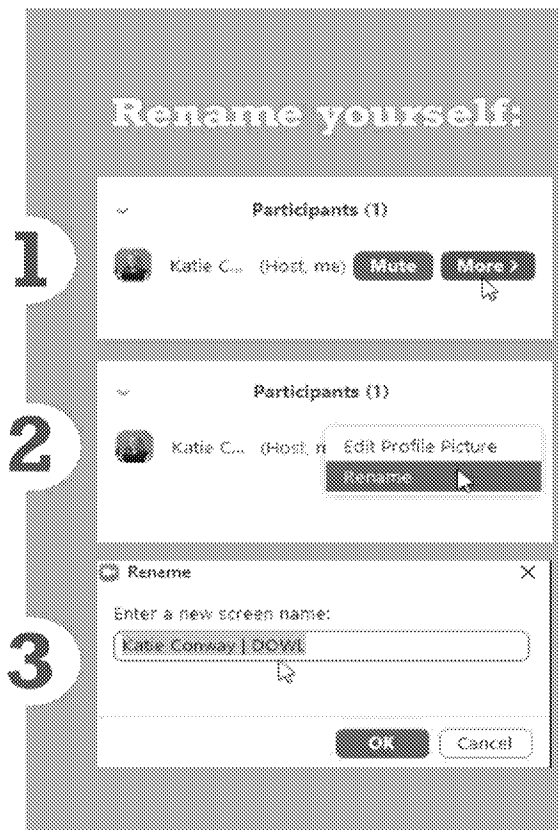


Make sure you are identified by name and organizational affiliation. Open the "Participants" window, hover your mouse over your name, select "More" and then "Rename."



If your connection cuts out this is the phone number you need to dial back into the meeting:

Ex. 6 Personal Privacy (PP)



Phone instructions:

*6 mute/un-mute

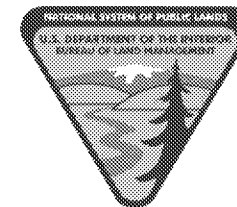
*9 raise hand



Agenda – Workshop #3



1. Welcome and Roll Call
2. Overview of Workshops
3. SEIS Format Overview
 - How to easily find new information on the new alternative E
4. Overview of Project and Alternative E
5. Updated Analysis for Air Quality and Greenhouse Gases
6. Q&A specific to GHG Analysis
7. Q&A specific to Air Quality Analysis
8. Q&A on any of the topics covered in the 3 workshops



Overview of Workshops

The primary goal of these workshops is to assist cooperating agencies in their review of the Pre-Draft SEIS.

Workshop Schedule:

- Thursday, March 17, 1330-1530: How to Read the SEIS, Water Resources and Wetlands, Q&A
- Wednesday, March 23, 1330-1530: Caribou and Subsistence, Overview of Comments Received During Scoping, Q&A
- Tuesday, March 29, 1330-1630: Air Quality and Greenhouse Gas Emissions, General Q&A on all key resources

Format of SEIS (example below):

*3.2.2.6 Alternative E: Four-Pad Alternative**

Tables 3.2.2, 3.2.3, and 3.2.4 provide the direct, indirect, and total GHG emissions under Alternative E using the different GWPs.

When applying the 100-year GWPs from the IPCC AR4, direct GHG CO₂e emissions over the 30-year Project life of Alternative E are 0.124% higher than Alternative B. In contrast, the indirect GHG emissions (as well as total GHG emissions) are lower under Alternative E than Alternative B because total oil production is lower under Alternative E and total emissions are dominated by indirect emissions. This is true when applying the other GWPs



Air Quality and Greenhouse Gas Analysis



Subject Matter Experts at Ramboll

Krish Vijayaraghavan, MS, Principal, 25 years experience

Courtney Taylor, MS, Senior Managing Consultant, 20 years experience

John Grant, MS, Managing Consultant, 16 years experience

Ross Beardsley, Ph.D., Managing Consultant, 10 years experience

Project Experience:

- Over 60 years collective experience studying air quality and/or GHGs including:
 - NPR-A IAP EIS, Alaska
 - Willow MDP FEIS, Alaska
 - Donlin Gold FEIS, Alaska
 - Resource Management Plans/EIS/Programmatic NEPA for BLM Field Offices for other states (e.g., North Dakota, Wyoming, Colorado, New Mexico, Oklahoma, Kansas, Texas)



Summary of Court's Key Findings

BLM's approval of the Willow Project under NEPA was vacated by the U.S. District Court of Alaska for the following reasons:

- 1) The exclusion of foreign (downstream) greenhouse gas emissions in the modeling that was done by BOEM for the alternatives analysis
- 2) The exclusion of potential viable alternatives that would minimize impacts to surface resources in the Teshekpuk Lake Special Area (TLSA)

On remand, the Court has directed BLM to reassess its alternatives analysis consistent with its findings



Overview of Project Alternatives

- Alternative A – No Action
- Alternative B – Proponent's Project
- Alternative C – Disconnected Infield Roads (no gravel road between BT1 and WPF, extra airstrip)
- Alternative D – Disconnected Access (no gravel road to GMT2)
- Alternative E – Four-pad Alternative (In response to Court Order)



Overview of SEIS GHG Sections Content

Chapter 3.2 (now also includes Alt E)

- 3.2.1 Global and regional trends in GHG/climate
- 3.2.2 GHG emissions summary
(now includes Alt E as well as foreign oil consumption)
- 3.2.3 Effects of climate change on the Project

Chapter 3.19

- Cumulative Effects

Appendix E.2A

- GHG/Climate Technical Appendix



Overview of SEIS AQ Sections Content

Chapter 3.3 (now also includes Alt E)

- 3.1.2.2 Air Emissions Inventory
- 3.1.2.3 Air Impacts Summary
- 3.1.2.4 Near-field Modeling
- 3.1.2.5 Regional Air Modeling

Chapter 3.19

- Cumulative Effects (also includes cumulative sources identified since FEIS)

Appendix E.3a

- AQ Appendix



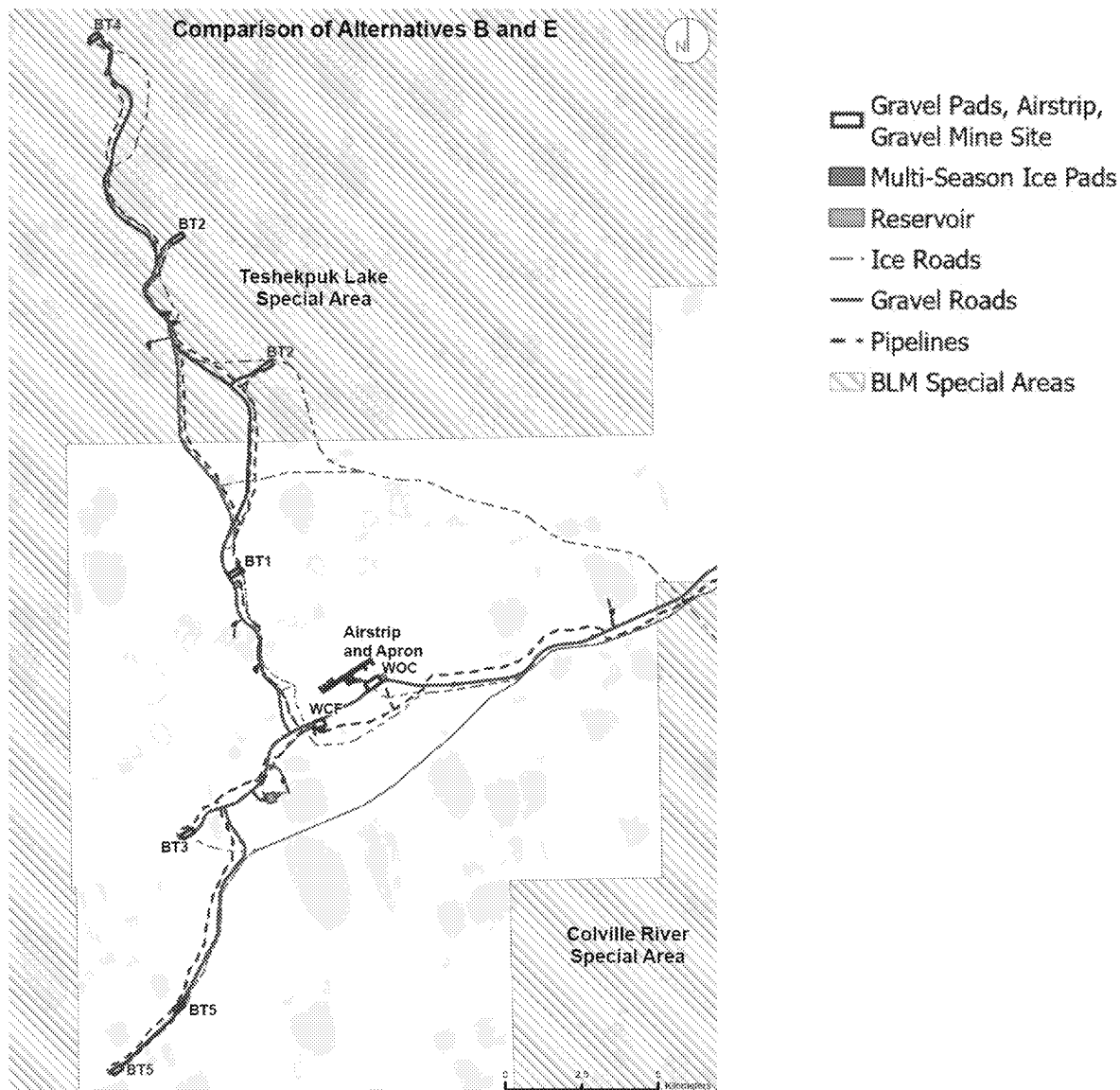
Overview of SEIS AQ Sections Content

Air Quality AQTSD (SEIS Appendix E.3b)

- Chapter 1: Introduction and Alternatives Descriptions
- Chapter 2: Emissions Inventories (Project and Cumulative)
- Chapter 3: Near-field Modeling (Approach and Results)
- Chapter 4: Regional Modeling Approach
- Chapter 5: Regional Modeling Results (AQ and AQRVs)
- Attachment G: Willow Development Emissions Inventory Report Alternative E



Differences between Alt B and Alt E





Key Findings of Updated Analysis

- Criteria and hazardous air pollutants below thresholds under Alt E and other action alternatives.
- Total GHG emissions under Alt E lower than other action alternatives
- Global GHG increase due to increased foreign oil consumption in all action alternatives
 - Lower under Alt E compared to other alternatives



Updated Analysis

- Greenhouse Gas Emissions Analysis
- Air Quality Analysis
 - Emissions Inventory
 - Air Quality Impacts





Greenhouse Gas (GHG) Emissions Analysis



Greenhouse Gases Overview

Update to FEIS	Reason
<ul style="list-style-type: none">• Addition of Alternative E	<ul style="list-style-type: none">• Alternative introduced due to U.S. District Court for Alaska order
<ul style="list-style-type: none">• Greenhouse gas (GHG) emissions associated with changes in foreign oil consumption estimated using EnergySub	<ul style="list-style-type: none">• U.S. District Court for Alaska order
<ul style="list-style-type: none">• Energy substitution rates from EnergySub	<ul style="list-style-type: none">• Availability of a model specifically designed to assess potential market impacts associated with changes in domestic onshore mineral development
<ul style="list-style-type: none">• Updated approach for indirect emissions from Project and energy sources displaced by the Project	<ul style="list-style-type: none">• More comprehensive representation of indirect emissions
<ul style="list-style-type: none">• Social Cost of GHGs	<ul style="list-style-type: none">• Executive Order 13990
<ul style="list-style-type: none">• Updated discussion of trends in climate and GHG emissions, and global warming potentials used	<ul style="list-style-type: none">• Incorporate most recent science and data



U.S. District Court for Alaska Order

- Change in foreign oil consumption

The Willow EIS “should have either given a **quantitative estimate of the downstream greenhouse gas emissions’ that will result from consuming oil abroad**, or ‘explained more specifically why it could not have done so,’ and provided a more thorough discussion of how foreign oil consumption might change the carbon dioxide equivalents analysis.”

- Approach for SEIS

- Change in foreign oil consumption estimated by BLM EnergySub
- Highest EPA stationary combustion emission factor across all petroleum products applied to change in foreign oil consumption for a conservatively high estimate of foreign consumption emissions
- Conservatively assumes 100% combustion



BLM EnergySub Model

- Adapted from BOEM's Market Simulation Model (MarketSim)
- Energy Substitution Model (EnergySub) analyzes how a change in onshore oil, gas, or coal production may affect energy markets more broadly, including global energy markets
- Uses the AEO 2021 Reference Case to calibrate



Energy Substitution Results

Percent of Willow Oil	Alt B	Alt C	Alt D	Alt E
Displaces Domestic Oil	30.3%	30.3%	30.4%	30.3%
Displaces Oil Imports	52.5%	52.5%	52.6%	52.4%
Displaces Natural Gas	1.5%	1.5%	1.6%	1.5%
Displaces Coal	0.4%	0.4%	0.4%	0.4%
Displaces Biofuels, NGL, and Electricity from non-Oil fuels	7.2%	7.2%	7.2%	7.2%
Changes in Demand	8.1%	8.1%	7.9%	8.2%



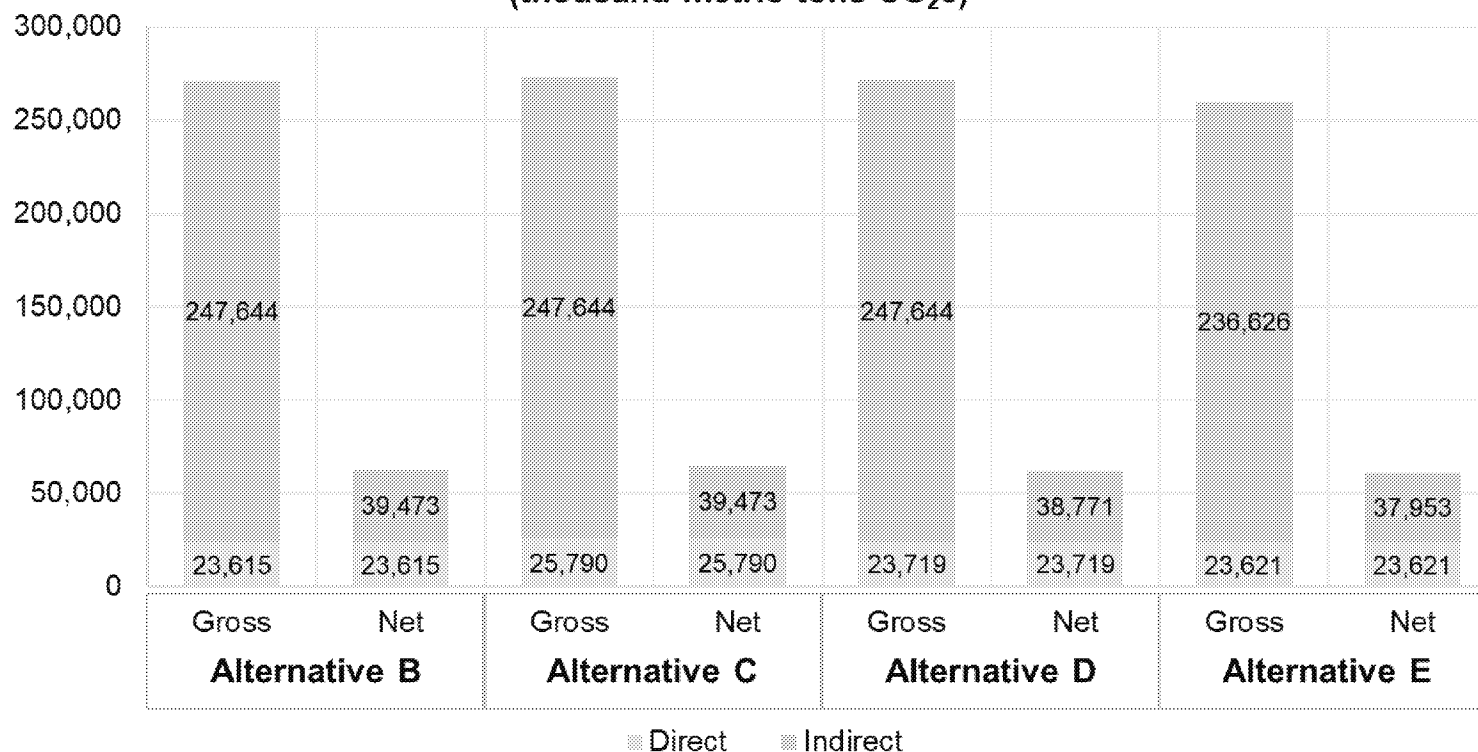
Direct and Indirect GHG Emissions

- Direct GHG emissions
 - Alternatives B, C, and D same as FEIS
 - Alt E GHG emissions from inventory developed by CPAI and reviewed/updated by BLM and Ramboll
- Indirect GHG emissions
 - Estimates of domestic energy substitution and changes in foreign oil consumption produced by EnergySub
 - Applied BOEM's Greenhouse Gas Life Cycle Energy Emissions Model (GLEEM) with updates
 - Updated the model to (1) better account for interannual fluctuations in inputs, (2) more comprehensively represent crude oil refinery emissions, and (3) conservatively assume 100% combustion of Project oil and displaced energy sources



Direct and Indirect GHG Emissions

Domestic Greenhouse Gas Emissions over Project Duration
(thousand metric tons CO₂e)



**Based on 20-Year Time Horizon Global Warming Potential Values from the IPCC Sixth Assessment Report*

- **Key conclusion for Alt E:** Total gross and net GHG emissions under Alt E lower than Alt B due to lower production



Greenhouse Gas Emissions from Change in Foreign Oil Consumption over Project Duration (thousand metric tons)

Alternative	CO ₂	CH ₄	N ₂ O	CO ₂ e*
B: Proponent's Project	62,910	2.5	0.5	63,245
C: Disconnected Infield Roads	62,910	2.5	0.5	63,245
D: Disconnected Access	63,117	2.5	0.5	63,452
E: Four-Pad Alternative	60,069	2.4	0.5	60,389

**Based on 20-Year Time Horizon Global Warming Potential Values from the IPCC Sixth Assessment Report, 2022*

- **Key conclusion for Alt E:** Cumulative GHG emissions due to change in foreign oil consumption are lowest under Alt E and approximately 23% of gross domestic (direct + indirect) emissions



Social Cost of Greenhouse Gases

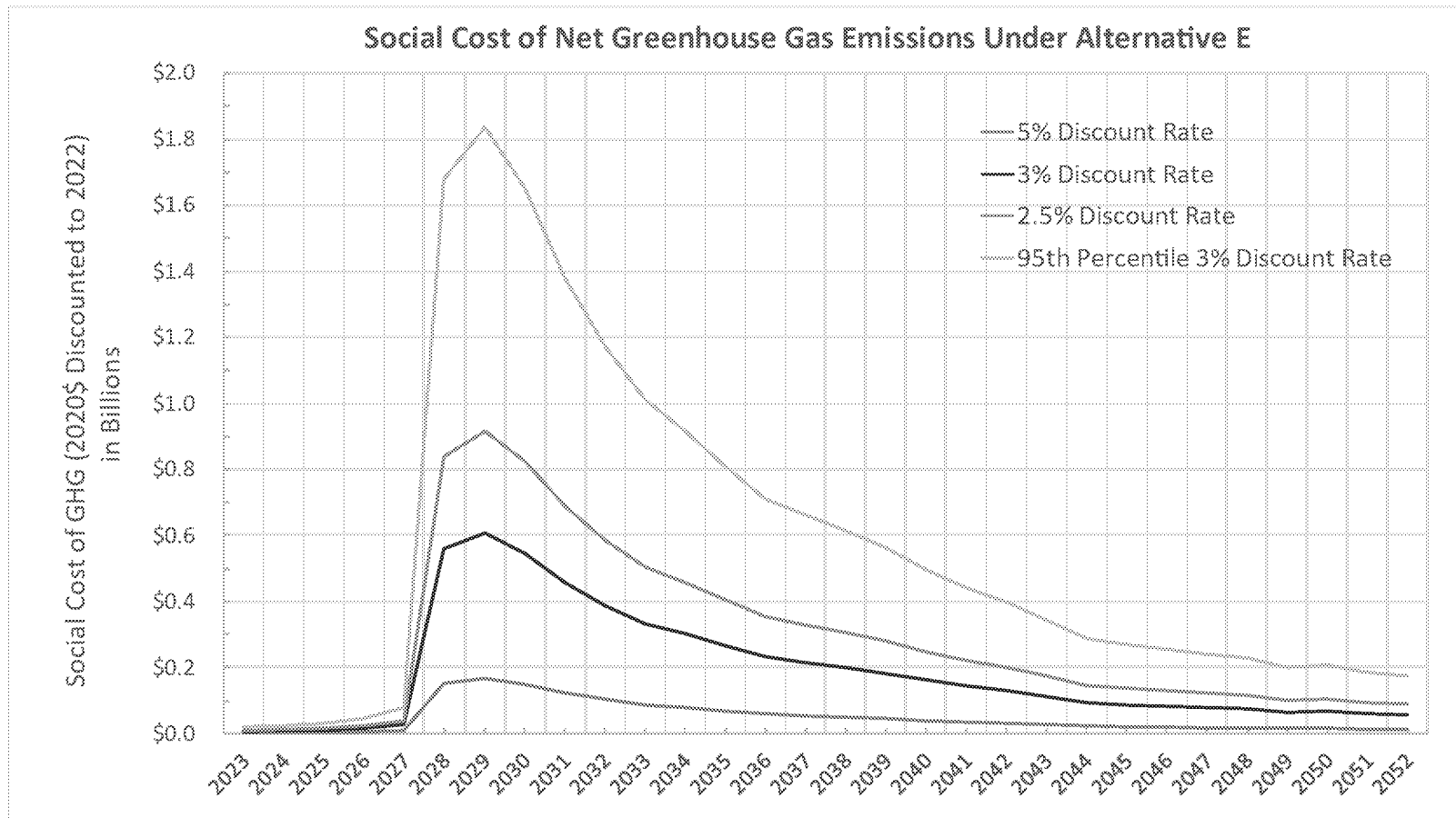
- Monetized impacts (cost) of **global** damages from incremental increases in GHG emissions
- Differs by GHG and year of emissions
- SEIS approach
 - Apply to direct, indirect (Project and displaced energy sources), and foreign GHGs across life of Project
 - Follow latest Interagency Working Group of SC GHG guidance (currently Interim Estimates under EO 13990)
 - Interim IWG guidance provides four different SC GHG values:

Interim IWG Discount Rate and Statistic			
5%, Average Damages	3%, Average Damages	2.5%, Average Damages	3%, 95 th Percentile Damages

- Placeholder in the admin draft SEIS. Results are provided below and will be discussed in Draft SEIS.



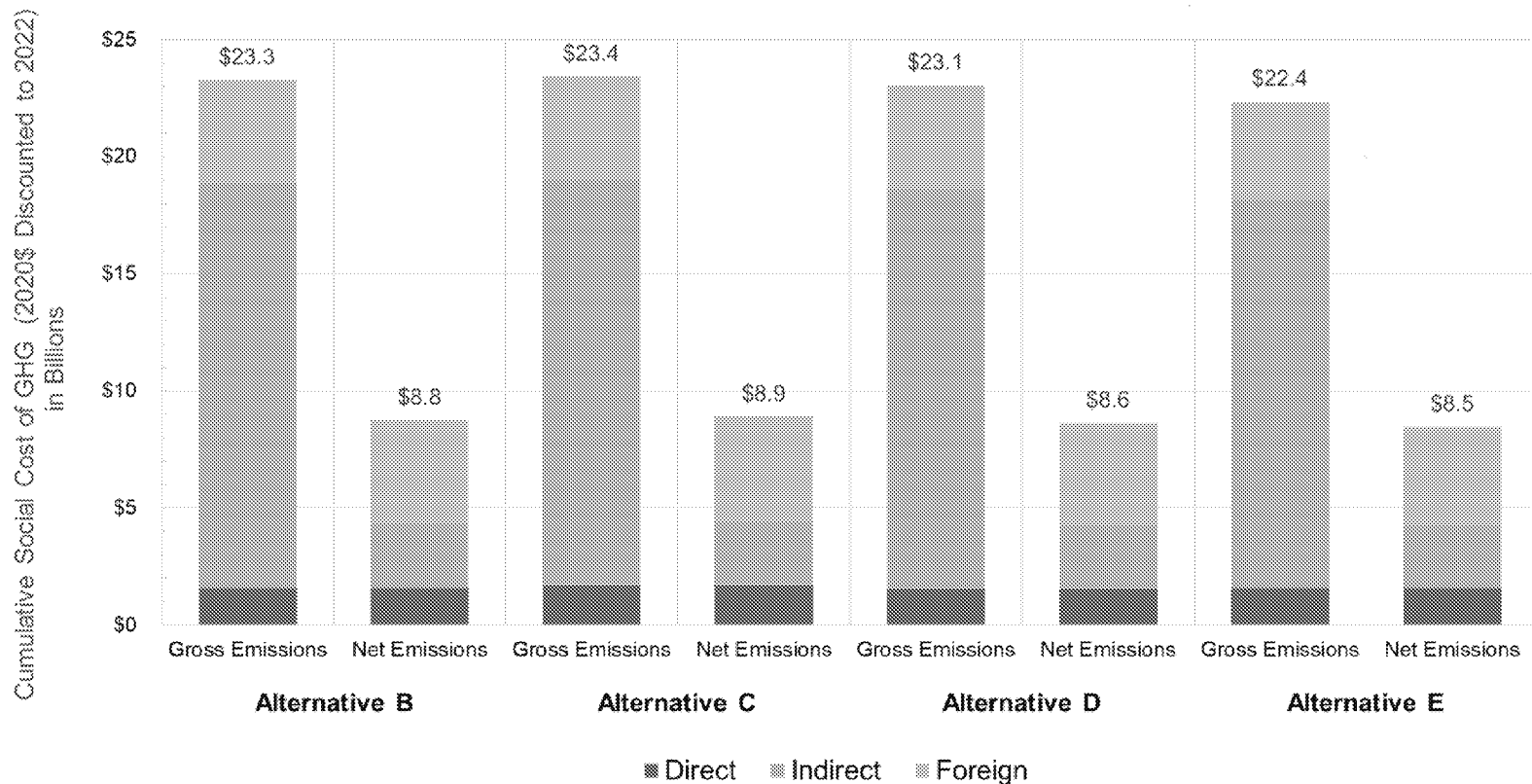
Social Cost of Greenhouse Gases



- Social cost of GHGs are highest in Year 7 of the Project corresponding with highest emissions and subsequently decrease



Global Cumulative Social Cost of GHG Emissions over Project Duration (\$ billions)



- Results shown above for 2.5% discount rate
- Social cost of GHGs are lower under Alt E than Alt B and other action alternatives

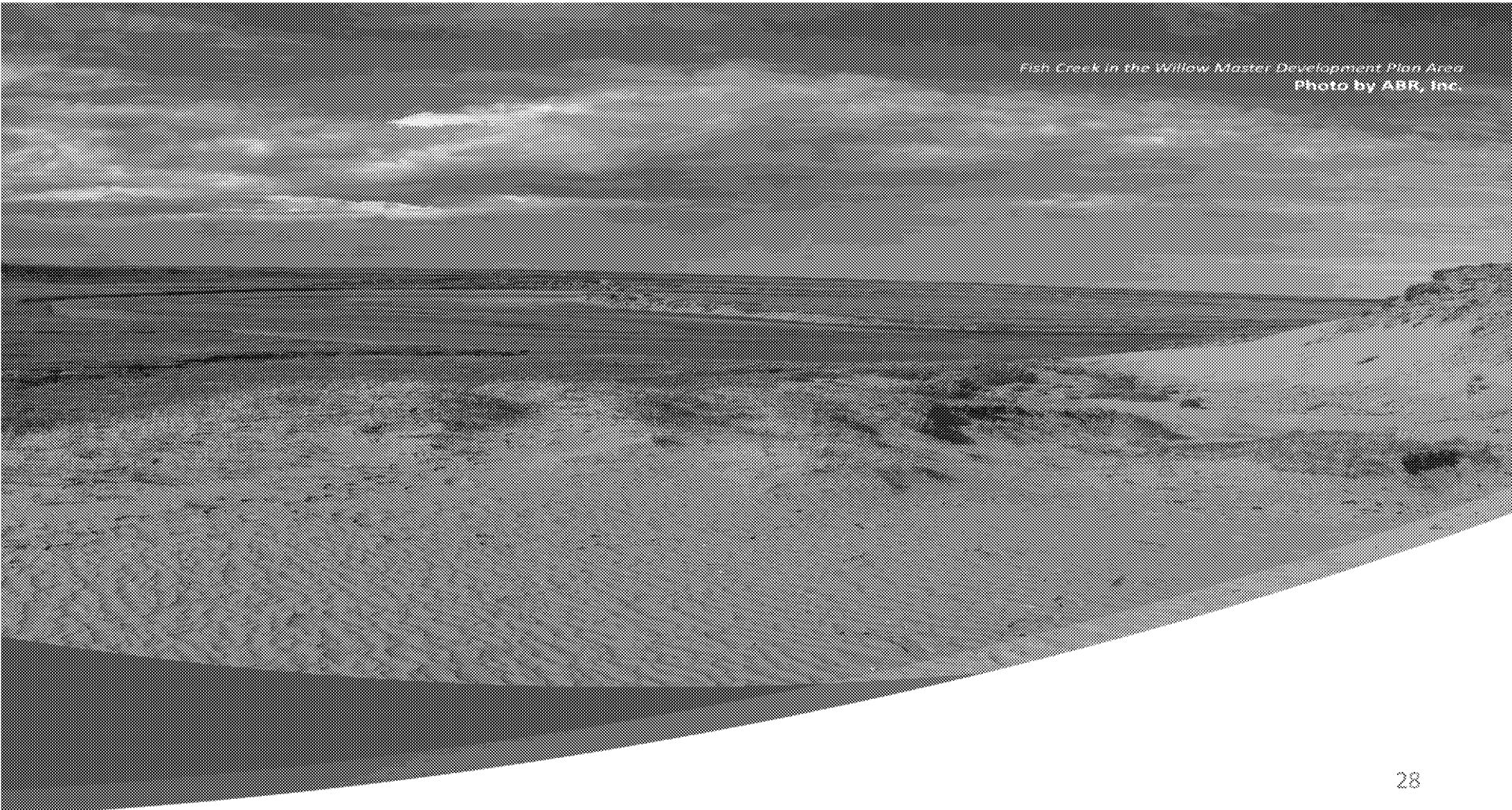


Key Findings / Comparison with Previous Preferred Alternative

- GHG emissions and social cost under Alternative E lower than Alternative B and other Action Alternatives
 - Direct emissions under Alt E slightly higher than Alt B
 - Indirect emissions significantly lower than Alt B
- Indirect GHG emissions are more than 90% of total emissions under all action alternatives
- GHG emissions from foreign oil consumption would increase due to Willow production under Alt E and all other action alternatives
- GHG emissions due to change in foreign oil consumption are lower under Alt E compared to Alt B and all other action alternatives



Q&A for GHG Emissions Analysis





Emissions Inventory



Emissions Introduction

- Alt E emission inventory developed by CPAI based on the FEIS Alt B emission inventory with updates to account for Alt E project differences such as emission sources and schedule
- Ramboll previously reviewed the FEIS Alt B emission inventory
- Ramboll reviewed and updated the Alt E emission inventory to ensure that the Alt E emission inventory accurately accounts for differences between Alt E and Alt B inputs and emissions



Emissions Comparison

Total Life-of-Project Criteria and Hazardous Air Pollutant Emissions (tons)*

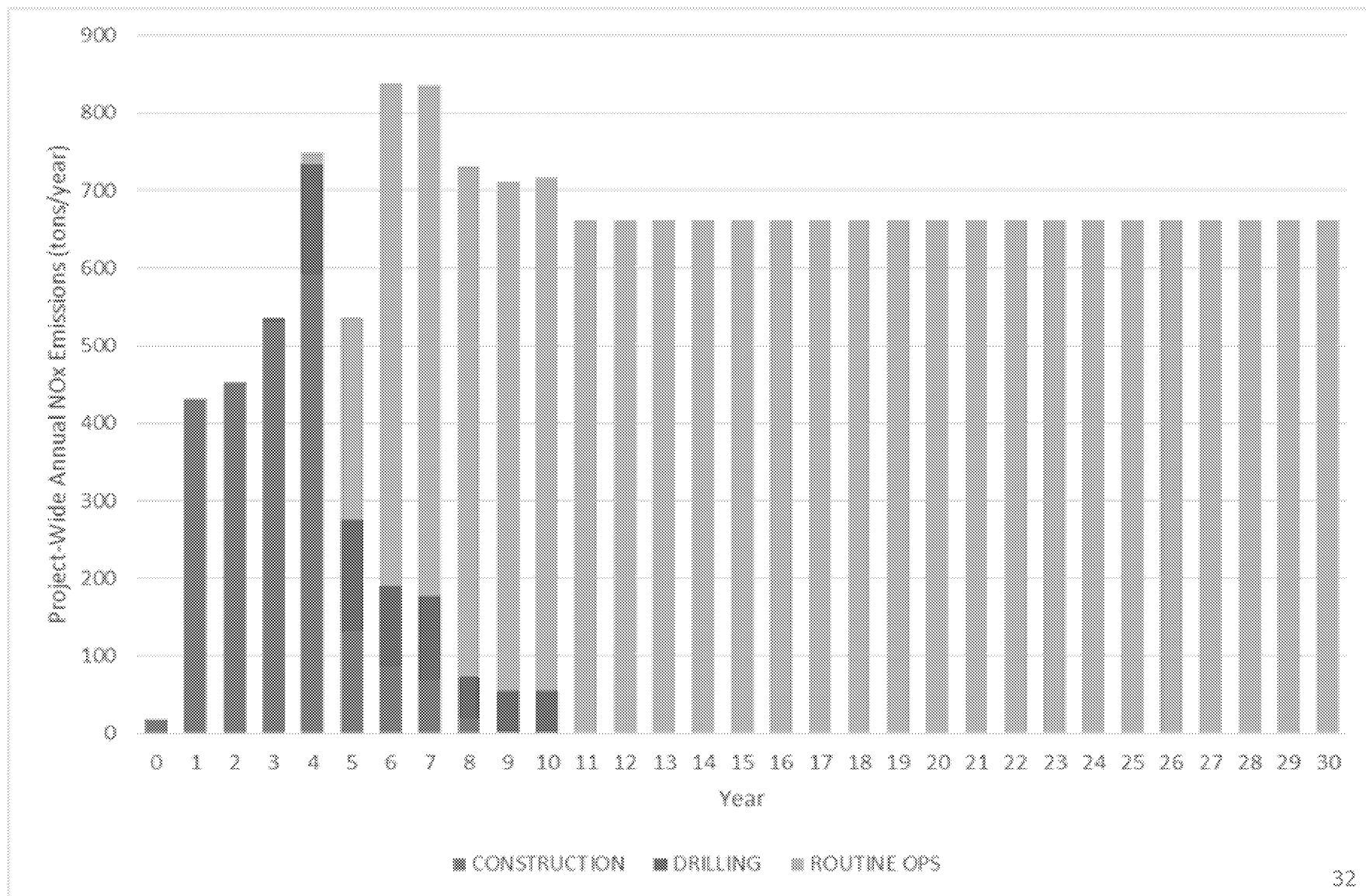
Alternative	NO _x	CO	SO ₂	PM ₁₀	PM _{2.5}	VOCs	HAPs
B: Proponent's Project	20,270	19,593	1,364	6,549	2,394	16,626	1,911
E: Four-Pad Alternative	20,287	19,505	1,362	6,626	2,405	15,541	1,748

** Module Delivery Option 1 (Atigaru Point Module Transfer Island). Other two Module Delivery Options are provided in the Admin Draft SEIS and AQTSD*

- Total Alt E emissions comparable to Alt B
- HAPs include formaldehyde, n-hexane, benzene, toluene, ethylbenzene, and xylenes

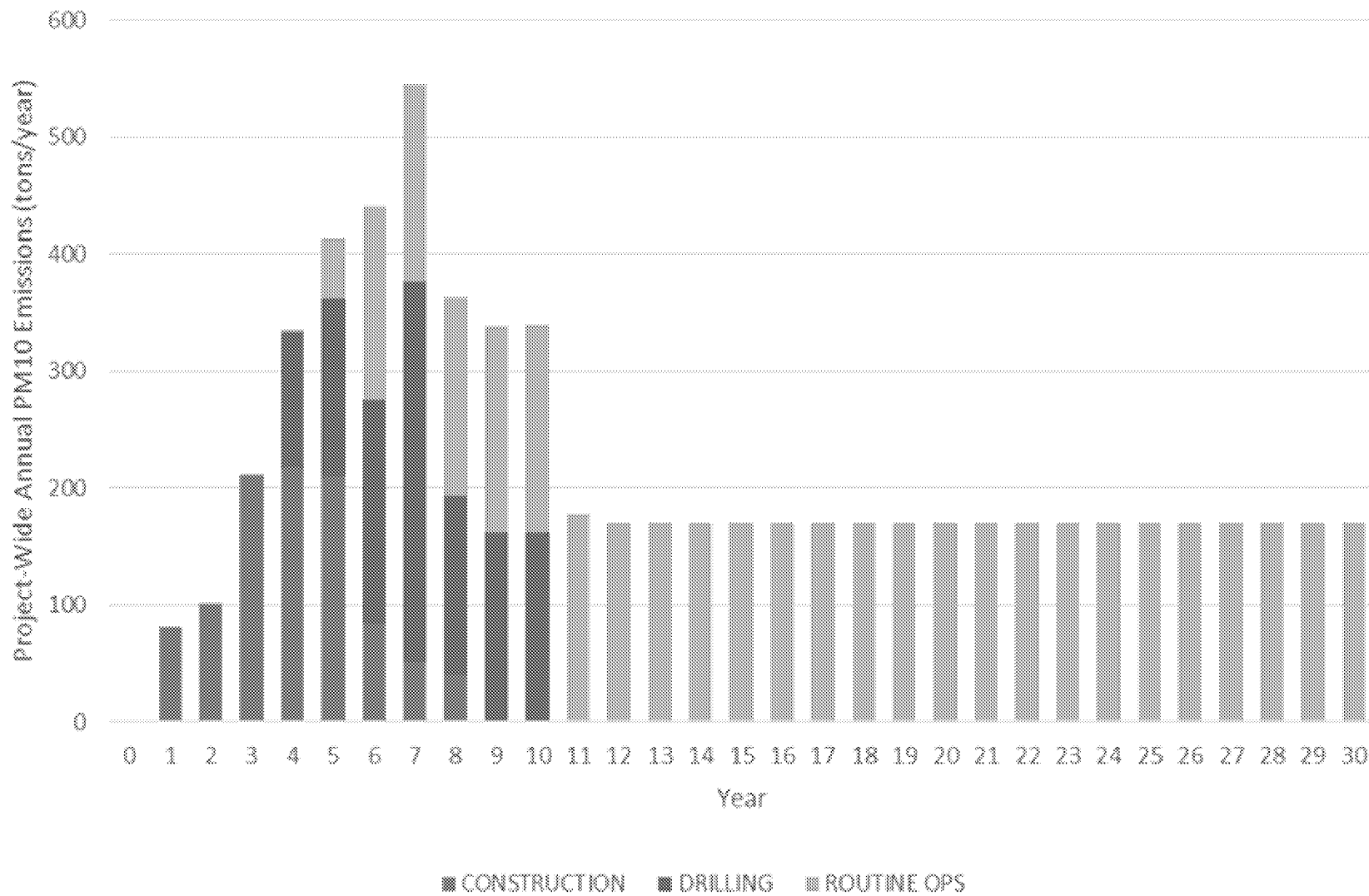


Alt E: NOx emissions over the life of the Project



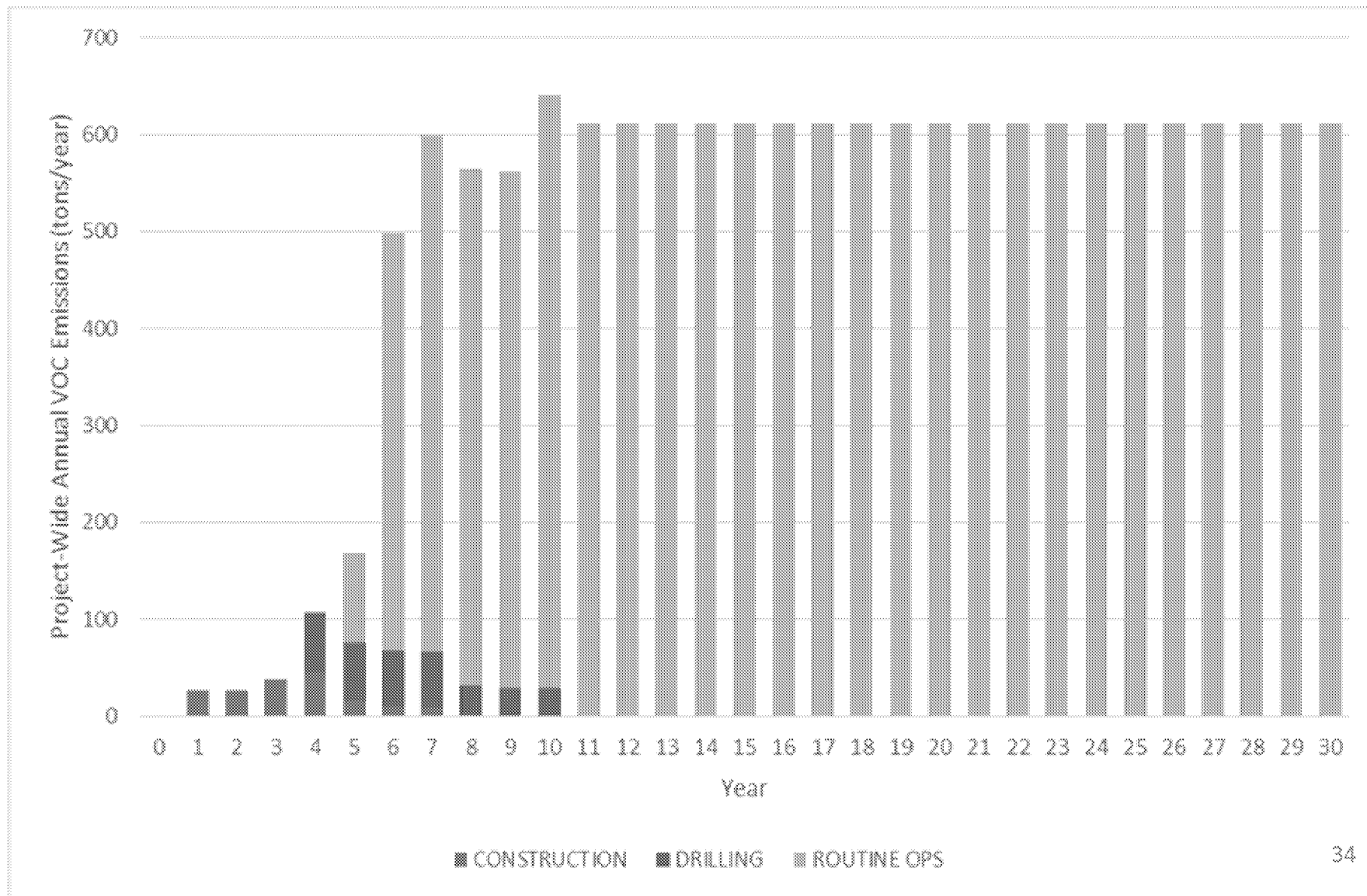


Alt E: PM₁₀ emissions over the life of the Project





Alt E: VOC emissions over the life of the Project





Key Findings / Comparison with Previous Preferred Alternative

- Alt E emissions are generally similar to Alt B (slightly larger for CAPs and slightly smaller for HAPs/VOCs)
- Small emissions decreases mainly for well drilling-related sources and fugitive components for Alt E compared to Alt B
- Small emissions increases mainly for an engine and an additional line heater at BT1 and BT2
- Alt E drilling and first production schedules are similar to Alt B



Air Quality Impacts



Air Quality Impact Analysis Introduction

- Alt B and Alt E emissions are very similar
 - No new modeling for Alt E in SEIS
 - Impacts under Alt E are estimated relative to Alt B modeled impacts
- FEIS modeled:
 - Near-field criteria air pollutants and hazardous air pollutants impacts with AERMOD
 - Regional cumulative air quality and Air Quality Related Values (AQRVs) with CAMx
- SEIS updated background values used in near-field criteria air pollutant impact analysis



Near-Field Modeling Approach

- Modeled 5 scenarios for each alternative:
 - Construction,
 - Pre-drilling at BT1,
 - Pre-drilling at BT1 and BT2,
 - Development Drilling and
 - Routine Operations
- Modeled 2 of the 3 module delivery options
- Criteria air pollutant (CAP) impacts compared to:
 - National and Alaska Ambient Air Quality Standard (AAQS) and
 - Prevention of Significant Deterioration (PSD) Increments
- Hazardous air pollutant (HAP) impacts compared to:
 - Acute, Sub-chronic, Chronic, and Carcinogenic thresholds

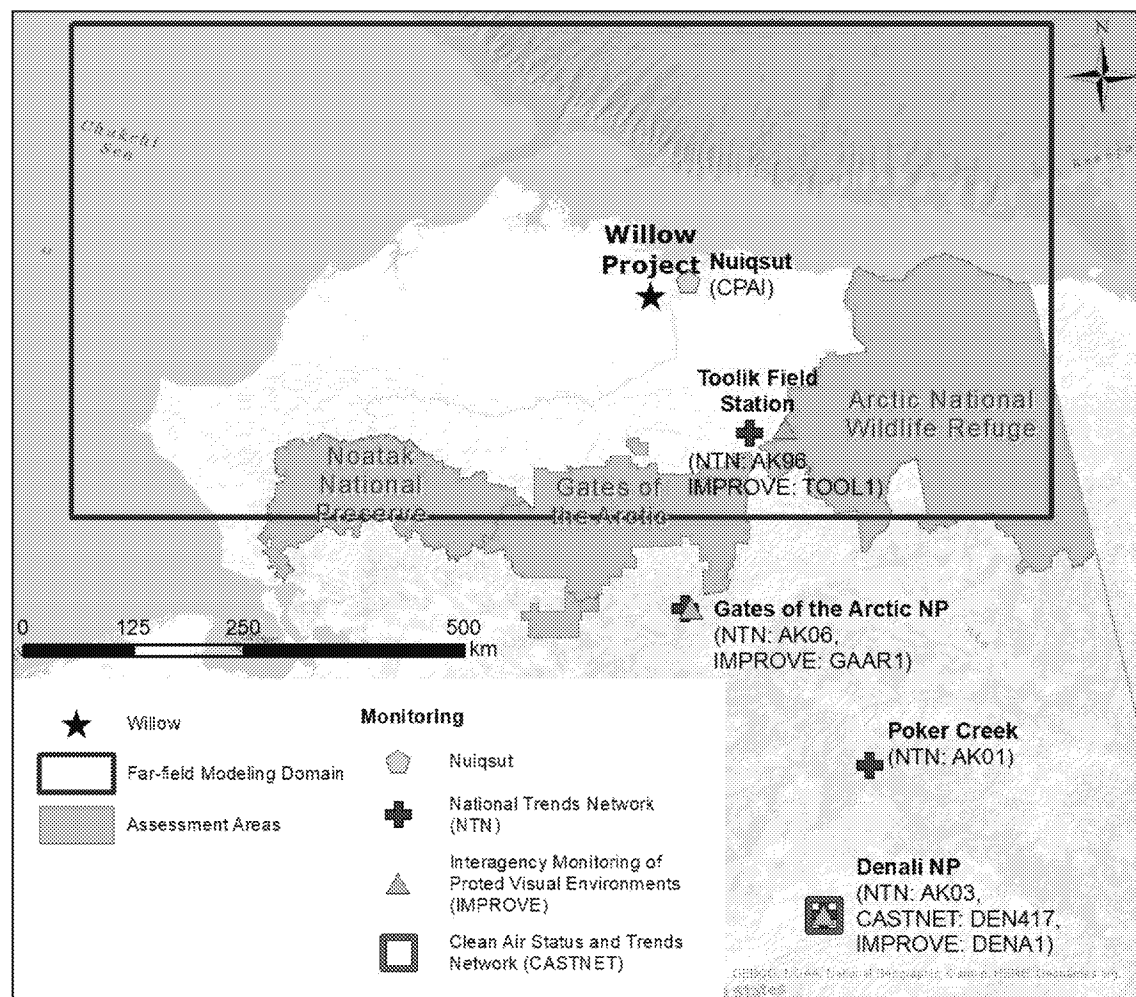


Alternative E Near-Field Impacts

Scenario	Criteria Air Pollutants	Hazardous Air Pollutants
Routine Operations	Impacts below AAQS	Routine operations below all thresholds (Alt E impacts similar to Alt B)
Construction	Impacts below AAQS (higher than Alt B but lower than Alt C)	HAPs emissions and impacts lower than Routine Operations
Pre-Drill at BT1	Impacts below AAQS	HAPs emissions and impacts lower than Routine Operations
Pre-Drill at BT1 and BT2	Impacts below AAQS	HAPs emissions and impacts lower than Routine Operations
Development Drilling	Impacts below AAQS	HAPs emissions and impacts lower than Routine Operations



Regional Assessment Areas





Alternative E Regional Impacts

Alternative	NO _x	CO	SO ₂	PM ₁₀	PM _{2.5}	VOC
Alternative B Peak Annual Emissions (tpy)	903.8	893.9	56.2	554.3	128.1	666.7
Alternative E Peak Annual Emissions (tpy)	838.6	839.9	54.9	545.7	126.9	641.8
Percent Difference (Alt E – Alt B)	-7.2%	-6.0%	-2.3%	-1.6%	-0.9%	-3.7%

- Regional cumulative air quality impacts under Alt E would be lower than Alt B
- Alt E would be below the PSD increment for all pollutants analyzed*
- Nitrogen and sulfur deposition would be lower under Alt E than Alt B
 - Project impacts are below Deposition Analysis Thresholds
 - Cumulative nitrogen deposition would be below critical load
- Visibility impacts under Alt E would be lower than Alt B
 - Impacts would be well below 0.5 delta deciview threshold



Key Findings / Comparison with Previous Preferred Alternative

- Alt E impacts estimated from Alt B modeling results and emissions differences
- Near-field analysis for Alt E and all other action alternatives:
 - CAP impacts would be below all ambient air quality standards for all pollutants
 - HAP impacts would be below all thresholds
- Far-field analysis:
 - Alt E impacts on CAPs and AQRVs would be lower than Alt B and below thresholds



Q&A for Air Quality Analysis



Fish Creek in the Willow Master Development Plan Area
Photo by ABR, Inc.



Q&A on Any of the Topics Covered in the 3 Workshops



Fish Creek in the Willow Master Development Plan Area
Photo by ABR, Inc.